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CLAIMS

Sub A1

1. An antibody which
   (i) reacts with an epitope on dendritic cells (DCs) displaying features of immature and/or mature DCs from peripheral blood mononuclear cells (PBMCs), but
   (ii) does not react with other PBMCs.

2. The antibody of claim 1, wherein said DCs represent a DC population of a maturational stage between immature and mature DCs.

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3. The antibody of claim 1 or 2, wherein said DCs are HLA-DR$^+$.

4. The antibody of any one of claims 1 to 3, wherein said DCs are CD64$^-$, CD33$^+$, CD45RA$^+$, CD11c$^+$ and p55$^-$ and mostly CD16$^+$.

5. The antibody of any one of claims 1 to 4, wherein said DCs are of restricted size and granularity located between lymphocytes and monocytes.

6. The antibody of any one of claims 1 to 5, wherein said antibody is a monoclonal antibody, polyclonal antibody, chimeric antibody, humanized antibody, bispecific antibody, synthetic antibody, antibody fragment, or a chemically modified derivative of any of these.

7. The bispecific antibody of claim 6 which recognizes an epitope specific for a tumor cell, a virus-infected cell, a T cell, a tumor-associated protein or a microbial protein.

8. The antibody of any one of claims 1 to 7, wherein said DCs are recognized by the antibody produced by hybridoma cell line DSM ACC2241, by hybridoma cell line DSM ACC 2399 or by hybridoma cell line DSM ACC 2398.

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9. The antibody of any one of claims 1 to 8 which is produced by hybridoma cell line DSM ACC2241, DSM ACC 2399 or DSM ACC 2998.

10. A continuous, stable antibody-producing cell line which is capable of producing an antibody of any one of claims 1 to 9.

11. The cell line of claim 10, wherein said cell line is a hybridoma cell line, preferably the hybridoma cell line having the deposit number DSM ACC2241, DSM ACC 2398 or DSM ACC 2399.

12. An antigen or an epitope thereof which is recognized by the antibody of any one of claims 1 to 9.

13. A polynucleotide encoding at least a variable region of an immunoglobulin chain of the antibody of any one of claims 1 to 9.

14. A vector comprising the polynucleotide of claim 13, optionally in combination with a polynucleotide of claim 13 that encodes the variable region of the other immunoglobulin chain of said antibody.

15. A host cell comprising a polynucleotide of claim 13 or a vector of claim 14.

16. A method for preparing an antibody capable of recognizing dendritic cells (DCs) from peripheral blood mononuclear cells (PBMCs) or a functional fragment or derivative thereof comprising
   (a) culturing the cell of any one of claims 10, 11 or 15; and
   (b) isolating said antibody, functional fragment or immunoglobulin chain(s) thereof from the culture.

17. An antibody, fragment or derivatives thereof or immunoglobulin chain encoded by a polynucleotide of claim 13 or obtainable by the method of claim 16.

18. A polypeptide comprising

(a) a domain of a binding site of the antibody of any one of claims 1 to 9 and 17 or an antigen or epitope of claim 12; and

(b) at least one further domain.

19. The polypeptide of claim 18, wherein said domains are linked by covalent or non-covalent bonds.

20. The polypeptide of claim 18 or 19, wherein said at least one further domain comprises an effector molecule having a conformation suitable for biological activity, capable of sequestering an ion or selective binding to a solid support or to a preselected determinant.

21. The polypeptide of claim 20, wherein said effector molecule is an enzyme, toxin, antigen, receptor, binding site, biosynthetic antibody binding site, growth factor, cell-differentiation factor, lymphokine, cytokine, hormone, a remotely detectable moiety, or anti-metabolite.

22. The polypeptide of claim 20, wherein said molecule capable of sequestering an ion is calmodulin, methallothionein, a fragment thereof, or an amino acid sequence rich in at least one of glutamic acid, aspartic acid, lysine, and arginine.

23. The polypeptide of claim 20, wherein said molecule capable of selective binding to a solid support is a positively or negatively charged amino acid sequence, a cysteine-containing amino acid sequence, streptavidin, a fragment of Staphylococcus protein A, GST, a His-tag or LexA.

24. The polypeptide of claim 21, wherein said receptor is a co-stimulatory surface molecule important for T-cell activation or comprises an epitope binding site or a hormone binding site.

25. The polypeptide of claim 24, wherein said co-stimulatory surface molecule is CD80 (B7-1) or CD86 (B7-2).

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26. A polynucleotide which upon expression encodes the antigen or epitope of claim 12 or polypeptide of any one of claims 18 to 25.

27. A vector comprising the polynucleotide of claim 26.

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28. A cell transfected with the polynucleotide of claim 26 or the vector of claim 27.

29. A method for the preparation of the antigen or epitope of claim 12 or a polypeptide of any one of claims 18 to 25 or a fragment thereof which process comprises cultivating a cell of claim 28 and isolating the polypeptide from the culture.

30. A method for isolating or identifying DCs as defined in any one of claims 1 to 4 from peripheral blood, comprising the steps of

(a) contacting a sample of peripheral blood with the antibody of any one of claims 1 to 9; and

(b) detecting the presence of antibody/DC complexes; and/or

(c) recovering dendritic cells which have bound to said antibody or functional fragment thereof.

31. Dendritic cells as defined in any one of claims 1 to 4, recognized by the antibody of any one of claims 1 to 9, containing an antigen or epitope of claim 12 or obtainable by the method of claim 30.

32. The dendritic cells of claim 31 which have been modified to express a recombinant nucleic acid molecule.

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33. A method for preparing activated antigen-specific human T-cells in vitro comprising co-culturing T-cells with the dendritic cells of claim 31 or 32, exposed to an antigen or expressing an antigen to activate the T-cells to proliferate or to become cytotoxic in response to the antigen.

34. A method for identifying an antigen recognizable by T-cells comprising

(a) co-culturing T-cells with the dendritic cells of claim 31 or 32, exposed to

said antigen, and

(b) measuring T-cell proliferation, T-cell cytotoxicity or T-cell lymphokine production.

35. The method of claim 33 or 34 wherein the T-cells are $CD4^+$ or $CD8^+$ cells.

36. A method for identifying T-cell activating or co-stimulating compounds comprising

(a) culturing the dendritic cells of claim 31 or 32 and T-cells in the presence of a component capable of providing a detectable signal in response to T-cell activation with a compound to be screened under conditions to permit interaction of the compound with the cells, and

(b) detecting the presence of a signal generated from the activation of the T-cells.

37. A method for identifying compounds which suppress T-cell activation or stimulation comprising

(a) contacting T-cells and dendritic cells of claim 31 or 32 in the presence of a component capable of providing a detectable signal in response to the activation of said T-cells by a T-cell activator with a compound to be screened under conditions to permit activation of the T-cell, and

(b) detecting the presence or absence of the signal generated from the interaction of the activator with the T-cells.

38. The method of any one of claims 33 to 37, wherein said dendritic cells are exposed to an antigen by incubation in culture media.

39. The method of any one of claims 33 to 38 or the polypeptide of claim 21, wherein said antigen is a tumor antigen, a viral antigen, a microbial antigen, an allergen, an auto-antigen, a virus, a microorganism, a polypeptide, a peptide or a plurality of tumor cells.

40. A method for the production of a pharmaceutical composition comprising the steps of the method of any one of claims 34 to 39 and (c) formulating the

compound identified in step (b) in a pharmaceutically acceptable form.

41. A kit comprising the antibody of any one of claims 1 to 9 and 17, the antigen or epitope of claim 12, the polypeptide of any one of claims 18 to 25, the polynucleotide of claim 13 or 26, the vector of claim 14 or 27, the dendritic cells of claim 31 or 32, the T-cells obtainable by the method of claim 33 or 35 or the compound obtainable by the method of any one of claim 38 to 40.

42. A composition comprising the antibody of any one of claims 1 to 9 and 17, the antigen or epitope of claim 12, the polypeptide of any one of claims 18 to 25, the polynucleotide of claim 13 or 26, the vector of claim 14 or 27, the dendritic cells of claim 31 or 32, the T-cells obtainable by the method of claim 33 or 35 or the compound obtainable by the method of claim 40

43. The composition of claim 42 which is a pharmaceutical composition optionally further comprising a pharmaceutical acceptable carrier.

44. A non-human transgenic animal comprising the polynucleotide of claim 13 or 26, the vector of claim 14 or 27, the dendritic cells of claim 31 or 32, the T-cells obtainable by the method of claim 33 or 35 or cells of claim 15 or 28.

45. A diagnostic composition comprising the antibody of any one of claims 1 to 9 and 17, the antigen or epitope of claim 12, the polypeptide of any one of claims 18 to 25, the polynucleotide of claim 13 or 26, the vector of claim 14 or 24 or the cells of claim 15 or 28 and optionally suitable means for detection.

46. A vaccine comprising the antigen exposed dendritic cells or antigen expressing DCs as defined in claim 31 or 32 or the antigen or epitope of claim 12.

47. An immunopotentiating composition comprising the dendritic cells of claim 31 or 32 and at least one antigen as defined in claim 12 capable of generating a protective immunological response to a disease in a human or an animal susceptible to such disease.

48. Use of the T-cells obtainable by the method of claim 33, 35, 38 or 39 for the preparation of a pharmaceutical composition for adoptive immunotherapy.

49. Use of the dendritic cells of claim 31 or 32 exposed to an antigen for the preparation of a pharmaceutical composition for activating T-cells in a human or an animal.

50. Use of the bispecific antibody of claim 5 or 6 for the preparation of a pharmaceutical composition for recruiting target cells with said dendritic cells.

51. The use of claim 50, wherein the target cells are tumor cells or virus-infected cells or cells infected with a microorganism.

52. Modification of dendritic cells as defined in any one of claims 1 to 5, 8, 31 or 32 by transfecting genes for cytokines or signaling molecules to modulate or program immune response in vitro or in vivo.

53. A method for identifying molecules synthesized by DCs having enhancing, modulating or suppressing effect on the antigen-specific activation of T cells comprising

(a) separating of molecules secreted by DCs of claim 31 into the culture supernatant and testing the enriched or isolated molecules for antigen-specific T cell activation in a cell culture system lacking DCs; and/or

(b) comparing gene expression in DCs of claim 31 with that in other antigen-presenting cells.

54. A method of propagating DC in vitro comprising

(a) culturing DCs of claim 31 in a specific cytokine cocktail supporting growth and proliferation of DCs in vitro; and/or

(b) immortalizing said DCs by transduction of transforming genes.